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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/853,732	05/11/2001	Ralph R. Dammel	2001US304	6502

7590 02/06/2003

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EXAMINER

THORNTON, YVETTE C

ART UNIT PAPER NUMBER

1752

DATE MAILED: 02/06/2003

5

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/853,732

Applicant(s)

DAMMEL ET AL.

Examiner

Yvette C. Thornton

Art Unit

1752

-- The MAILING DATE of this communication appears in the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 May 2001 .
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 6-24 is/are rejected.
- 7) ☒ Claim(s) 5 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2-3 .
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____ .

DETAILED ACTION

This is written in reference to application number 09/853732 filed on March 11, 2001 and published as US 2002/0187419 A1 on December 12, 2002.

Information Disclosure Statement

1. The Information Disclosure Statements filed on March 22, 2001 and September 11, 2002 have been entered and fully considered.

Specification

2. The abstract of the disclosure is objected to because it contains the word "novel" in lines 1-3. The examiner believes that the term "novel" references purported merits or speculative applications of the invention, which is not proper. Correction is required. See MPEP § 608.01(b).

Claim Objections

3. Claims 2-14 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claims 2-14 as written fail to include all the limitations of the parent claim. The said claims further limit the copolymer, which is only one component of the photoresist composition of the independent claim. The examiner suggests re-wording the claims to pertain to the "photoresist composition of claim 1". For the purposes of examination, claims 2-14 have been interpreted to include all the limitations of independent claim 1.

Art Unit: 1752

4. The examiner further notes that if claims 2-14 are amended to pertain to the copolymer alone, the applicant introduces a double patenting issue over claims 1-12 of commonly assigned US 6486282.

5. The examiner suggests amending claims 15-20 to refer to the photoresist composition of claim 1.

6. Claim 19 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 19 as written depends on claim 16, however claim 16 fails to incorporate a base component. The examiner believes claim 19 was ✓ intended to depend from claim 18, which further limits claim 1 to include a base.

7. Claim 20 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 1 as written already contains a solvent.

Claim Interpretations

8. The examiner has interpreted lines 14-20 of claim 1 to be a list of groups from which ✓
R₅-R₁₄ can be selected. For better clarity, the examiner suggests amending the Markush group to read as follows:

--where R₅-R₁₄ is selected from the group consisting of hydrogen, (C₁-C₆)alkyl, halogen, carboxylic acid, (C₁-C₁₀)alkyOCOalkyl, cyano(CN), (C₁-C₁₀)secondary or tertiary carboxylate, substituted pinacol, fluoroalkyl, an acid labile group, a base labile group, W(CF₃)₂OH wherein W is (C₁-C₆) alkyl or (C₁-C₆) alkyl ether and wherein R₇ and R₈ may be linked to form a cyclic non-aromatic structure--.

Art Unit: 1752

9. The examiner does not view claims 2-3 as being limited to the choice of R_{5-14} being an acid labile group or R_7 and R_8 being linked to form a lactone or anhydride, respectively. It is the examiner's position that the claim limitations would be met when any of the Markush groups of instant claim 1 are present.

10. The examiner has interpreted claim 13 to be an absorption coefficient of the claimed copolymer at 157 nm based on the disclosure in the specification on page 9, lines 25-28.

11. The following rejections are based on the above interpretations.

Claim Rejections - 35 USC § 102

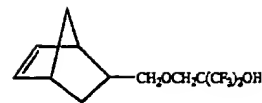
12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

13. Claims 1-3, 6-14, 16-17 and 20-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Fryd et al. (US 6,503,686 B1). Fryd teaches a photoresist comprising a nitrile-containing compound and a fluoroalcohol functional group which together simultaneously impart high UV transparency and developability in basic media (abstract). Example 5 exemplifies the synthesis of a copolymer comprising acrylonitrile having the structure $\text{CH}_2=\text{CHCN}$; 1,1,1-trifluoro-4-methyl-2- (trifluoromethyl)-4-penten-2-ol having the structure $\text{CH}_2=\text{C}(\text{CH}_3)\text{CH}_2\text{C}(\text{CF}_3)_2\text{OH}$; 3-[(bicyclo[2.2.1]hept-5-en-2-yl)methoxy]-

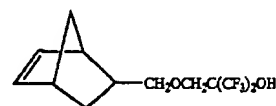
Art Unit: 1752



1,1,1-trifluoro-2-(trifluoromethyl)-2-propanol having the structure:

and t-butyl acrylate. The molar ratio of the copolymer is 62:4:18:16 mole percentage. The resulting polymer was found to have a molecular weight of 2,646 (M_n) and a polydispersity of 1.44 (c. 20, l. 60-c. 21, l. 49), which gives a weight average molecular weight of approximately 3,810 (2646×1.44). The said polymer was used to produce two films. The first film having a thickness of 579 Angstroms and an absorption coefficient of 3.98 at 157 nm. The second film having a thickness of 702 Angstroms and an absorption coefficient of 3.77 at 157 nm (c. 21, l. 50-56). Example 6 further exemplifies using the said copolymer in a photoresist composition comprising the solvent propylene glycol methyl ether acetate and the photoacid generator triphenylsulfonium triflate. The formed solution was spin-coated on a silicon wafer. Spin coating was done using a combination spin coater/hotplate on a 4 inch diameter wafer. The coated wafer was then baked at 120°C for 60 seconds and exposed to 248 nm light. The exposed wafer was then baked at 100°C for 120 seconds (instant claim 23). The wafer was developed with an aqueous tetramethyl-ammonium hydroxide (TMAH) solution to obtain a positive image (c. 21, l. 60-c. 22, l. 42).

It is the examiner's position that acrylonitrile of the taught copolymer meets the limitation of claimed structure (1); and 3-[(bicyclo[2.2.1]hept-5-en-2-yl)methoxy]-1,1,1-



trifluoro-2-(trifluoromethyl)-2-propanol having the structure:

meets

the limitations of claimed formula (2) wherein $m=0$; R_5 , R_8 , R_{10} , and R_{13-16} each is hydrogen

Art Unit: 1752

and R_7 is $W(CF_3)_2OH$ where $W=CH_2OCH_2C$ which is a carbon 3 ether. Furthermore, t-butyl acrylate of the taught copolymer meets the limitation of an additional acrylate monomer as set forth in instant claims 10-12.

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 4 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fryd et al. (US 6503686 B1) as applied to claims 1-3, 6-14, 16-17 and 20-24 above. Fryd exemplifies all the limitations of the claimed invention, as discussed above, except it fails to exemplify a copolymer wherein the ethylenic unit is derived from the monomers of instant claim 4. Fryd also fails to exemplify a photoresist composition further comprising a dissolution inhibitor. Fryd does however teach that at least a portion of the nitrile functionality that is present in the taught copolymer results from the incorporation of repeat unit(s) derived from at least one compound having the structure: $(H)(R_1)C=C(R_2)(CN)$ wherein R_1 is H or CN; R_2 is C_{1-8} alkyl, H or CO_2R_3 where R_3 is C_{1-8} alkyl group or H (c. 4, l. 66-c. 5, l. 11). It would have been obvious to one of ordinary skill in the art to make a photoresist composition such as that exemplified in example 6 comprising a copolymer having a nitrile component wherein R_2 is CO_2R_3 and R_3 is either C1 or C4 alkyl group.

Fryd further teaches that various dissolution inhibitors can be utilized in the taught invention. Ideally, dissolution inhibitors for far and extreme UV resist should be chosen to satisfy multiple needs such as dissolution inhibition, plasma etch resistance and adhesion (c. 10, l. 33-40). One of ordinary skill in the art would have been motivated by the teachings of Fryd to incorporate a dissolution inhibitor into the exemplified composition of example 6 in order to satisfy multiple needs including dissolution inhibition, plasma etch resistance and adhesion.

16. Claims 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fryd et al. (US 6,503,686 B1) as applied to claims 1-3, 6-14, 16-17 and 20-24 above, and further in view of Choi (US 6,045,970 A). Fryd, as discussed above, teaches all the limitation of the claims except the incorporation of a base into the taught photoresist composition. It is the examiner's position that it is well-known and conventional in the art of photoresist and photolithography to incorporate a base into a photoresist composition in order to suppress the dissolution rate at which the acid generated from the photoacid generator diffuses into the resist coating. This position is supported by the teachings of Choi (US 6045970), which teaches a photoresist composition further comprising an organic base. Examples of suitable base components include triethylamine, triisobutylamine, diethanolamine and triethanolamine (c. 4, l. 23-31). One of ordinary skill in the art would have been motivated to incorporate an organic base such as triethylamine, triisobutylamine, diethanolamine and triethanolamine as taught by Choi into the photoresist composition of Fryd in order to decrease the critical pattern size after exposure caused by acid diffusion into the unexposed areas.

Allowable Subject Matter

17. Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

18. The following is a statement of reasons for the indication of allowable subject matter: review of the prior art failed to teach and/or suggest the monomers of instant claim 5 in combination with an ethylenic unit having a cyano group as set forth in the instant claims.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

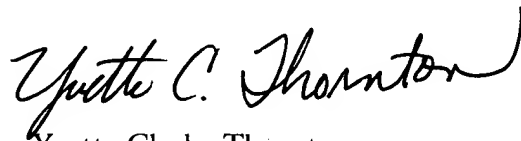
- Dammel et al. (US 6486282 B1 and US 2003/0013831 A1) pertaining to polymers containing a cyano functionality, which are suitable for photoresist compositions.
- Li et al. (US 2003/0008502 A1) pertaining to resist composition with polymers having 2-cyano acrylic monomers.
- Uetani et al. (US 2002/0081524 A1) pertaining to the polymerization of an alicyclic hydrocarbon and a (meth)acrylonitrile.
- Taylor et al. (US 6165674 A) which teach polymers and photoresist compositions for short wavelength imaging.
- Ito et al. (US 6509134 B2) which teach norbornene fluoroacrylate copolymers.
- Houlihan et al. (US 5843624 A) pertaining to an energy sensitive resist material.
- Nozaki (US 5399647 A) pertaining to a photoresist composition of 1-(1'-cyanoethenyl)adamantane.

Art Unit: 1752

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yvette C. Thornton whose telephone number is 703-305-0589. The examiner can normally be reached on Monday-Thursday 8-6:30.

21. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Janet C. Baxter can be reached on 703-308-2303. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

22. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1495.



Yvette Clarke Thornton
Junior Examiner
Art Unit 1752

yct
January 30, 2003